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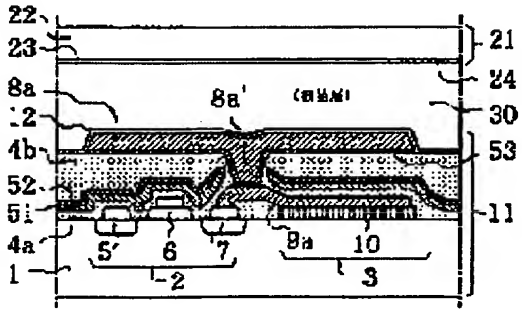
(54) REFLECTION TYPE IMAGE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a high reflection factor and prevent incident light from entering a substrate to cause deterioration in picture quality.
SOLUTION: A light shield layer 51 is interposed in insulator layers 4a and 4b on condition that at least the gap area between reflecting electrode layers 8a and the overlap area of non-metal constitution areas of active element circuits 2 and 3 are included in a plan viewed from the incidence direction of read light; and the surface of an insulator layer 4b is flattened into an optical mirror surface state and then a reflecting electrode 8a is formed. The generation of photoconduction can be prevented since there is no area where the read light enters the substrate 1 directly and a reflection factor of ≥90% is obtained since the surface of the reflecting electrode layer 8a has extremely high flatness. Further, reflection preventive films 52 and 53 are formed on the opposite surface sides of the reflecting electrode layer 8a and light shield layer 51, so the incidence of light reflected repeatedly between the layers can be prevented.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The 1st connection which connects a switching element, the charge storage capacitance section, and the output terminal and said charge storage capacitance section of said switching element to a substrate side, The reflector layer formed in the wrap insulator layer and the front face of the insulator layer in them, And the active element substrate which arranged many active element circuits for 1 pixel which consist of the 2nd connection which penetrates said insulator layer and connects said reflector layer and said 1st connection in the shape of a matrix, It consists of light modulation layers ****(ed) between the common electrode layer sides of the transparence substrate with which the transparent common electrode layer is formed in one side, and the reflector layer side of said active element substrate and said transparence substrate. In the reflective mold image display device which is made to produce the potential difference and is made to modulate and reflect the incident light to a transparence substrate in a light modulation layer between said reflector layers and said common electrode layers corresponding to the signal inputted into the control terminal of said switching element While being set up so that a protection-from-light layer (one layer or two or more layers) may be made to infix in the interior of said insulator layer and the infixation field may include the duplication field of the clearance field between each reflector layer, and the nonmetal configuration field of an active element circuit at least with the top view seen from [of read-out light] incidence The reflective mold image display device characterized by having turned flattening of the front face of said insulator layer up to the optical mirror plane condition, and forming said reflector layer.
[Claim 2] The 1st connection which connects a switching element, the charge storage capacitance section, and the output terminal and said charge storage capacitance section of said switching element to a substrate side, The reflector layer formed in the wrap insulator layer and the front face of the insulator layer in them, And the active element substrate which arranged many active element circuits for 1 pixel which consist of the 2nd connection which penetrates said insulator layer and connects said reflector layer and said 1st connection in the shape of a matrix, It consists of light modulation layers ****(ed) between the common electrode layer sides of the transparence substrate with which the transparent common electrode layer is formed in one side, and the reflector layer side of said active element substrate and said transparence substrate. In the reflective mold image display device which is made to produce the potential difference and is made to modulate and reflect the incident light to a transparence substrate in a light modulation layer between said reflector layers and said common electrode layers corresponding to the signal inputted into the control terminal of said switching element The whole surface other than the opening is made into a wrap mode. much more — since, while making the becoming protection-from-light layer infix in the interior of said insulating layer, and the infixation field's seeing from [of read-out light] incidence and preparing opening outside the formation field of said switching element The reflective mold image display device characterized by said 2nd connection having penetrated said opening.
[Claim 3] The reflective mold image display device of claim 2 currently formed so that a connection part with the output terminal of the switching element in the 1st connection may cover the formation field of the output terminal of said switching element at least.
[Claim 4] The reflective mold image display device of claim 1 which constituted the reflector layer from aluminum containing the silicon or/and copper of aluminum or a minute amount, claim 2, or claim 3.
[Claim 5] The reflective mold image display device of claim 1 claim 2 which formed in either or the both sides of an opposite side front face of both the layers in a reflector layer and a protection-from-light layer the antireflection film which becomes either or the both sides of an opposite side front face of a protection-from-light layer comrade from an ingredient with the small rate of a light reflex when a protection-from-light layer was made into two or more layers again, claim 3, or claim 4.
[Claim 6] The reflective mold image display device of claim 1 in which the antireflection film which consists of an ingredient with the small rate of a light reflex was formed to either or the both sides of a protection-from-light layer and the opposite side front face of both in the metal configuration section of an active element circuit, claim 2, claim 3, claim 4, or claim 5.
[Claim 7] it becomes a front face by the side of the reflector layer in an active element substrate from two or more dielectric

films — an increase — reflection — a membrane layer — the reflective mold image display device of formed claim 1, claim 2, claim 3, claim 4, claim 5, or claim 6.
[Claim 8] an increase — the reflective mold image display device of claim 7 with which a reflective membrane layer carries out the laminating of the film of silicon oxide and a titanic-acid ghost by turns, and makes thickness of the whole 5000A or less.
[Claim 9] The reflective mold image display device of claim 1 which carried out flattening of the front face which is filled up with an insulating ingredient between the reflector layers of each active element circuit, and an insulating ingredient makes to the optical mirror plane condition, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7, or claim 8.
[Claim 10] the means which carries out flattening of the front face which the front face or each reflector layer, and each insulating ingredient of an insulator layer make to an optical mirror plane condition — CMP (Chemical Mechanical Polish) — the reflective mold image display device of claim 1 which is law, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7, claim 8, or claim 9.
[Claim 11] The reflective mold image display device of claim 1 which formed the isolation region with the same conductivity-type semi-conductor as the conductivity type of the input terminal section of said transistor, and the output terminal section between each active element circuit field when an active element substrate constituted a switching element as a transistor on a semi-conductor substrate, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7, claim 8, claim 9, or claim 10.
[Claim 12] The reflective mold image display device of claim 1 which formed said transistor in the field of the semi-conductor well which is a conductivity type opposite to the conductivity type of the input terminal section and the output terminal section, and was separated for every transistor when an active element substrate constituted a switching element as a transistor on a semi-conductor substrate, claim 2, claim 3, claim 4, claim 5, claim 6, claim 7, claim 8, claim 9, claim 10, or claim 11.

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] While this invention relates to the reflective mold image display device for displaying an image on a big screen and raising the rate for Mitsutoshi with a high reflection factor, it is related with the structural amelioration for preventing that incident light invades in a substrate and drawing quality deteriorates.
[0002]
[Description of the Prior Art] Recently, the requests of the projection mold display for displaying an image on a big screen are mounting like the display for a display of the highly minute image of the display of the object for the outdoor public, or control business use, Hi-Vision, etc. Although there is a thing of a transparency mold method and a reflective mold method when it divides roughly into a projection mold indicating equipment, the former is a method on which the light which penetrates the liquid crystal panel which arranged the pixel which consists of a thin film transistor and a transparent electrode in the shape of a matrix is made to project and the latter is a method on which the light reflected with the aforementioned liquid crystal panel is made to project, in the projection mold indicating equipment, it has been the most important technical problem to display an image on high brightness.
[0003] Although there is an advantage that a transparency mold method can be comparatively simple for the configuration of optical system, and it can manufacture cheaply, there is a fault that the rate of the area which the transistor which controls the electrical potential difference of a pixel electrode, and wiring occupy will become large if a display panel is miniaturized, a numerical aperture becomes small, and the brightness of an image falls. On the other hand, in a reflective mold method, since a transistor and wiring can be arranged to the reflector layer down side, the number of pixels can be increased without reducing a numerical aperture, and the image of high resolution can be displayed by high brightness. Therefore, in the image display device of an expansion projection method, it is small and the direction of the reflective mold method in which densification is possible is suitable.
[0004] Although the research on a reflective mold image display device is indicated by the Institute of Electronics and Communication Engineers technical research report CMP 78-71, JP,57-39422,B, JP,4-338721,A, etc., structure as shown in drawing 19 is adopted as the common equipment carried out now. In this drawing, 1 is Si substrate and MOS-FET2 and the charge storage capacitance 3 are formed of the semi-conductor process on it. For 4, as for the drain of MOS-FET2, and 6, an insulator layer and 5 are [the gate and 7] the sources here. moreover — while 8 is the reflector layer of aluminum formed on

the insulator layer 4 and a part of the bottom is connected to the source 7 of MOS-FET2 — a conductor tabular from the connection part — the section 9 is extended to the side — making — a conductor — the charge storage capacitance 3 consists of making the insulator layer 10 of SiO2 intervene between the section 9 and the Si substrate 1. That is, the active element substrate 11 is constituted as a whole by forming the active element circuit which consists of MOS-FET2 which is a switching element per 1 pixel, and the charge storage capacitance section 3 to the Si substrate 1. On the other hand, 21 is a transparence substrate and has structure which formed the transparent common electrode layer 23 in one side of a glass substrate 22. And the front face where the reflector layer 8 and the insulator layer 4 by the side of the active element substrate 11 appeared, and the front face of the common electrode layer 23 by the side of the transparence substrate 21 are covered with the orientation film 12 and 24, respectively, the liquid crystal layer 30 is ****(ed) and closed among the orientation film 12 and 24 of each substrates 11 and 21, and the panel section of a reflective mold image display device is constituted as a whole.

[0005] Next, while the representative circuit schematic of drawing 20 also refers to actuation of this equipment, it explains. First, the signal line Yj with which the gate line Xj which energizes a selection signal energizes a picture signal to the electrode of a drain 5 is connected to the electrode of the gate 6. if a selection signal is impressed to the gate 6 through the gate line Xj, while MOS-FET2 will serve as ON and the picture signal of a signal line Yj will be impressed to the reflector layer 8 through the source 7 here from a drain 5 — a conductor — the charge storage capacitance 3 is charged through the section 9. Moreover, even if the selection signal of the gate line Xj is set to 0 level and will be in the condition of not choosing, with the charge accumulated in the charge storage capacitance 3, the potential of the reflector layer 8 is held only for the time amount which becomes settled in the charge storage capacitance 3 and the time constant by discharge resistance.

[0006] And by controlling the potential difference by the picture signal of a signal line Yj, since the potential difference between the reflector layer 8 and the common electrode layer 23 is impressed to the time zone to the liquid crystal layer 30 and the light transmittance of liquid crystal changes, after carrying out incidence to a glass substrate 22, it becomes possible to modulate the light which reflects in the reflector layer 8 and carries out outgoing radiation from a glass substrate 22 again. Specifically a selection signal is energized on the gate line Xj, all MOS-FET2 of the direction of X is made into an ON state, and the reflected light which modulated incident light (read-out light) per pixel by the method of writing in to each charge storage capacitance 3 connected to MOS-FET2 turned on while scanning a picture signal in the direction of Y through a signal line Yj is obtained.

[0007]

[Problem(s) to be Solved by the Invention] By the way, also in the conventional reflective mold image display device, when obtaining the image of high quality by high brightness, the following troubles are pointed out.

The 1st trouble; as shown in drawing 19 , the reflector layer 8 makes the insulator layer 4 placed between the MOS-FET2 and charge storage capacitance 3 bottoms, and is arranged in them, but when MOS-FET2 grade is formed on the Si substrate 1, irregularity occurs unescapable, and since irregularity occurs also in the insulator layer 4 formed on it, the front face of the reflector layer 8 cannot be formed evenly. therefore, the time of read-out light reflecting, if a level difference part is in the reflector layer 8 — the reflection factor — falling — high — there is a problem that a brightness image is not obtained.

[0008] On the other hand, as a cure on the problem, in case MOS-FET2 is formed, the technique which carries out flattening of the wiring as much as possible is proposed (JP,1-35351,B). However, such a cure means cannot desire so big effectiveness, when it stops at the improvement to at most about thousands ofA and aims at improvement in brightness on the level of granularity or a wave. For example, when projection mold television is assumed as an application of a reflective mold image display device, even if the irregularity in said level exists Though dispersion is produced, since it is projected on some reflected lights on a comparatively small screen, big effect does not arise, but in projecting on a large-sized screen by the projection mold projector in order to strengthen incident light very much, and to expand the reflected light with a lens and to make image display perform, the linearity of a very high light requires — having — the above improvement level — high quality — high — when obtaining a brightness image, effectiveness is hardly acquired. That is, in order to make the linearity of a light excellent in the projection mold projector etc. secure, the display flatness required of the reflector layer 8 is the level of a divisor 10 - 100A of numbers, and the display flatness obtained as the conventional cure is less than the level. consequently, several 100- which remained — the level difference of thousands of A, and a wave — light — the condition of normal — not reflecting — the rate for Mitsutoshi — falling — the image whole — ** — it becomes dark.

[0009] Moreover, in order to make the property of the liquid crystal layer 30 regularity collectively, forming on a flat substrate at homogeneity is important also for the orientation film 12. Although the whole reflector of the reflector layer 8 needs to make it anyway the irregularity which is dozens of A if the above point is taken into consideration, the thing to which display flatness was made to secure to the level with the present reflective mold image display device does not exist.

[0010] The 2nd trouble; if read-out light is strengthened in order to raise the brightness of the projection image with a reflective mold image display device, as shown in drawing 21 The light 42 which carries out incidence to the clearance 41 between the reflector layers 8 for every pixel invades into the Si substrate 1, photograph conduction (generation of carriers by the light from the outside) arises, and there is a problem of the potential of the reflector layer 8 falling without MOS-FET2 operating normally, and degrading image quality. Namely, although the reflector layer 8 will be held at + potential based on the picture signal of a signal line Yj if P type, and the drain 5 and the source 7 of MOS-FET2 are made into an N type diffusion layer for the conductivity type of the Si substrate 1 and the Si substrate 1 is maintained at GND potential in drawing 21 Although a carrier (pair of an electron and an electron hole) is generated in the Si substrate 1 and an electron hole is absorbed to the GND side when read-out light invades into the Si substrate 1 from the aforementioned clearance 41, an electron will reach to the drain 5 and the source 7 of + potential, and + potential of the reflector layer 8 will fall.

[0011] This fall electrical potential difference; dV (V) is given by dV=1.51x1013xPxRxrx (L/d), when specific inductive capacity of L (cm) and liquid crystal is set [the rate of the light which invades luminous intensity into the Si substrate 1 of P (W/cm)

and the read-out light / R and the wavelength of (%) and light] to d for the thickness of r (cm) and the liquid crystal layer 30, without taking the charge storage capacitance 3 into consideration. being referred to as P= 10, R= 0.001, r=5000/1018, L=5/104, and d= 10 with this formula — dV= — although set to 37.8 (V), if the capacity value of the charge storage capacitance 3 is generally about about 10 times of the capacity value of the liquid crystal layer 30 and the charge storage capacitance 3 is taken into consideration — dV= — it is set to about 3.8 (V). Therefore, the aforementioned cure against protection from light and the aforementioned cure against photograph conduction in permeation light even if a slight light called 1/100,000 of read-out light invades into the Si substrate 1, when the potential of the reflector layer 8 will fall also several volts and prevents degradation of an image become very important.

[0012] Therefore, about the problem of photograph conduction, the following cures are proposed from the former.

** In order to secure the protection-from-light nature of a semi-conductor substrate, prepare the multilayer dielectric reflective film which carried out the laminating of the insulator layer to amorphous Si, and constitute the ideal reflective film using a multiple echo (JP,4-51070,B).

** Carry out the laminating of the film of a low reflection factor, such as titanium, to the front face of wiring of the active element section, and control scattered reflection light (JP,5-241199,A).

** Prepare the protection-from-light layer of a metal membrane in the reflector layer bottom (JP,61-43712,B).

** Semiconductor regions other than the formation field of the active element section are doped by high concentration, and it will be made to disappear, by the time it shortens life time of a carrier and recombines with an active element (JP,4-34313,B).

** Form the well of the conductivity type of a semi-conductor substrate, and an opposite conductivity type all over the semi-conductor substrate, form the active element section in the well, and make a well absorb another side for one side of an optical carrier to a semi-conductor substrate side (JP,3-288474,A).

[0013] However, there are the following troubles also in the technique of each set policy.

** ******** — if it is going to make only; multilayer dielectric reflective film perform perfect reflection, since the thickness of the reflective film must become large, and driver voltage impressed to a pixel electrode by the impedance of the reflective film must be enlarged and opposite spacing of a pixel electrode and a common electrode becomes large, the resolution of a projection image will fall [electric field] as ** to the side.

** ******** — only by control of the scattered light in; active element section, permeation light to a semi-conductor substrate cannot be prevented, and it does not become sufficient cure against an optical carrier.

** ******** — although the protection-from-light function of; protection-from-light layer can be evaluated once, the light which carried out incidence from between each reflector layer reflects it multiply between each reflector layer and a protection-from-light layer, and light carries out incidence to a semi-conductor substrate side from the clearance constituted between each reflector layer, the connection of the charge storage section, and a protection-from-light layer. In order to compensate the lowness of the reflection factor in a reflector layer especially, the inclination will become remarkable if a strong read-out light is irradiated. In addition, at JP,61-43712,B, the problem of a multiple echo is not described, either and there is not necessarily light which reaches "MOS transistor. however, the magnitude of a metallic reflection electrode (equivalent to the aforementioned reflector layer) — opening (equivalent to the aforementioned clearance) — comparing — since it is overwhelmingly large — direct rays — as follows — 100,000 — there was no generating of the current by the photoconductive effect also under the brightness which exceeds lux(es). It is considering as ". However, in the projector which carries out expansion projection, the light of 100,000 or more luxes is irradiated as a read-out light, and leak of the light which originated in the multiple echo in such a model cannot be disregarded. Therefore, it cannot be said that it is still enough only with a means to prepare a protection-from-light layer. Moreover, although making the aforementioned clearance small and controlling permeation light is also considered, if it actually manufactures, and it is going to acquire sufficient effectiveness, a reflector layer and a protection-from-light layer will short-circuit in many cases, and the yield of a product will get very bad.

** ******** — on the occasion of manufacture of; semi-conductor substrate, complicated processes, such as an epitaxial stroke, are needed, and aggravation of the yield and the problem of cost arise.

** ******** —; — drawing 22 corresponding to drawing 21 explains the configuration of JP,3-288474,A. For example, well 1a of P type is formed all over one side of the Si substrate 1 of N type, and MOS-FET2 of N channel mold is constituted in the well 1a, and well 1a is made into GND potential, the Si substrate 1 is made into + bias potential, and it carries out to making it operate. Even if a carrier is generated in N type partial 1b of the Si substrate 1 bottom by permeation light in the configuration, since an electron is absorbed for an electron hole in the N type part 1 at the well 1a side, a carrier does not reach the drain 5 or the source 7 of MOS-FET2. By the way, MOS-FET2 is fixed for operating normally, and well 1a certainly needs to be fixed to GND potential. However, in order for well 1a to usually have only the thickness of about 3 micrometers and to maintain the operating characteristic of MOS-FET2, it must be made high resistance to some extent, but since the GND node of well 1a is taken in the periphery section of a panel side, in the field greatly isolated from the GND node, potential destabilizes it, and actuation of MOS-FET2 destabilizes it as a result, and it causes deterioration of image quality. As mentioned above, about conventional protection from light and cure against photograph conduction, if independent, it is inadequate, or a technical problem is left behind theoretically. When the lowness of a reflection factor tends to be compensated with read-out luminous intensity and it is going to obtain high brightness especially, there is a problem that image quality deteriorates, and the reciprocity relation of brightness and image quality is an important technical problem.

[0014] then, this invention — the 1st and 2nd above-mentioned troubles — rational — canceling — a high reflection factor — — high — while making brightness image display possible, also when projecting on a large-sized screen using a strong read-out light, it was created for the purpose of offering the reflective mold image display device which can secure high image quality.

[0015]

[Means for Solving the Problem] The 1st connection by which this invention connects a switching element, the charge storage

capacitance section, and the output terminal and said charge storage capacitance section of said switching element to a substrate side, The reflector layer formed in the wrap insulator layer and the front face of the insulator layer in them, And the active element substrate which arranged many active element circuits for 1 pixel which consist of the 2nd connection which penetrates said insulator layer and connects said reflector layer and said 1st connection in the shape of a matrix, It consists of light modulation layers ****(ed) between the common electrode layer sides of the transparence substrate with which the transparent common electrode layer is formed in one side, and the reflector layer side of said active element substrate and said transparence substrate. In the reflective mold image display device which is made to produce the potential difference and is made to modulate and reflect the incident light to a transparence substrate in a light modulation layer between said reflector layers and said common electrode layers corresponding to the signal inputted into the control terminal of said switching element While being set up so that a protection-from-light layer (one layer or two or more layers) may be made to infix in the interior of said insulator layer and the infixation field may include the duplication field of the clearance field between each reflector layer, and the nonmetal configuration field of an active element circuit at least with the top view seen from [of read-out light] incidence The reflective mold image display device characterized by having turned flattening of the front face of said insulator layer up to the optical mirror plane condition, and forming said reflector layer is started.

[0016] If the general arrangement conditions of the protection-from-light layer in this invention are fulfilled, it can prevent that read-out light carries out direct incidence to the active element circuit and the base of an active element substrate at least, and fundamental protection from light and cure against photograph conduction can be aimed at. moreover, the reflection factor by the reflector layer is improved -- making -- high -- when obtaining a brightness projection image, it is very effective to once carry out flattening of the insulator layer to a mirror plane condition, and to make a reflector layer form on it. In the conventional reflective mold image display device, as shown in drawing 19 , the irregularity of the formation field of a switching element 2 appears in the insulator layer 4, but since the reflector layer 8 is made to form as it is, without also performing any processing, irregularity has arisen on the front face of the reflective mold electrode layer 8. In this invention, also when the irregularity resulting from the level difference of a switching element does not appear in a reflector layer, but can constitute the front face of a reflector layer from extremely excellent display flatness and it gives the orientation film by flattening of an insulator layer, membranes can be formed to homogeneity. That is, the reflection factor of read-out light is raised greatly, and image display of high brightness is realized. In addition, as a light modulation layer, a carrier is generated not only according to a typical liquid crystal layer but according to exposure light reinforcement, and PROM (Pockels Readout Optical Modulator) which refractive-index change (optical induction refractive-index change) produces through the Pockels effect in the electric field by the spatial distribution, and the thing using the distorted bias effectiveness of PLZT (compound of Pb, La, Zr, and Ti) can also be used.

[0017] By the way, in the aforementioned invention, if the whole surface other than opening which the 2nd connection penetrates with the top view which looked at much more protection-from-light layer from [of read-out light] incidence inside the insulating layer is made to infix in a wrap mode and the 2nd connection connects the 1st connection with a reflector layer through the opening, it will become the most effective cure against photograph conduction. However, the read-out light which invaded from the clearance between reflector layers reflects in a protection-from-light layer also in such a case, the reflected light reflects multiply between a reflector layer and protection-from-light layers, and the problem of reaching to a switching element part through the clearance between the 2nd connection and opening which is making it penetrating is left behind. Even if it is effective to form said opening in fields other than the formation field of a switching element, i.e., to keep away the clearance which the 2nd connection and opening make from the formation field of a switching element as much as possible, and there is the aforementioned secondary permeation light by it to the problem, it becomes possible to reduce the amount of attainment to a switching element part.

[0018] Moreover, in the cure against photograph conduction, if the connection with the output terminal of the switching element in the 1st connection is formed so that the formation field of the output terminal of the switching element may be covered at least, an output terminal part can be covered to a duplex, it will become possible to detour further the path which a secondary permeation light reaches to an output terminal, and big effectiveness will be acquired.

[0019] In addition, as for the aforementioned reflector layer, it is desirable to constitute from aluminum containing the silicon or/and copper of not only aluminum but a minute amount which are a common electrode material. By making silicon and copper of a minute amount contain, it is because surface rough ** and the surface wave at the time of forming a reflector layer can be prevented and improvement in a reflection factor can be realized further.

[0020] Moreover, even if it prepares a protection-from-light layer on which the above-mentioned infixation conditions, it is effective to take the still more nearly following optical measures about the photograph conduction based on a secondary permeation light accompanying a multiple echo. That is, when a protection-from-light layer is made into two or more layers again, it is effective in either or the both sides of an opposite side front face of both the layers in a reflector layer and a protection-from-light layer to form the antireflection film which becomes either or the both sides of an opposite side front face of a protection-from-light layer comrade from an ingredient with the small rate of a light reflex. It is because multiple echo light is lessened and the photograph conduction by the dispersion can be controlled.

[0021] Moreover, if the antireflection film which consists of an ingredient with the small rate of a light reflex is formed in either or the both sides of a protection-from-light layer and the opposite side front face of both in the metal configuration section of an active element circuit also about the multiple echo light which leaks below a protection-from-light layer, photograph conduction can be controlled by the above and law of identity.

[0022] next, apart from flattening of the aforementioned insulator layer, it becomes a front face by the side of the reflector layer in an active element substrate from two or more dielectric films as a means which raises the reflection factor in a reflector layer -- an increase -- reflection -- a membrane layer -- if it forms, it is possible to raise the reflection factor of read-out light still more greatly. although the thickness became large inevitably and problems, such as an increment in driver voltage and degradation of resolution, arose with the conventional technique (JP,4-51070,B and JP,4-338721,A), in order to

make the multilayer dielectric reflective film perform perfect reflection — this invention — an increase — the reflective film plays a reflector layer and the role with which a reflection factor is raised conjointly, and since an extensive improvement of a reflection factor is attained with a comparatively small number of layers, the aforementioned problem is not produced, either.
[0023] Moreover, as another problem, although a crevice exists between each reflector layer, weld flash etc. tends to generate the part like the formation fault of a reflector layer, and a front face is rough **********. therefore — above — the increase of the front face by the side of a reflector layer — reflection — a membrane layer — the case where it constitutes — a crevice — unusual — an increase — reflex action — scattered reflection occurs and the contrast of a projection image and the fall of resolution are caused. To the problem, it is filled up with an insulating ingredient between the reflector layers of each active element circuit, and the aforementioned fault can be canceled by carrying out flattening of the front face which the insulating ingredient makes to an optical mirror plane condition.
[0024] next — even if it takes the above various measures — in addition — and read-out light may infiltrate into the base substrate of an active element substrate [when an active element substrate constitutes a switching element as a transistor on a semi-conductor substrate to the problem] (1) The structure in which the isolation region with the same conductivity-type semi-conductor as the conductivity type of the input terminal section of a transistor and the output terminal section was formed between each active element circuit field, (2) It is effective to adopt the structure in which the transistor was formed in the field of the semi-conductor well which is a conductivity type opposite to the conductivity type of the input terminal section and the output terminal section, and was separated for every transistor. Even if an optical carrier is generated with the permeation light which reached the base substrate in the case of the structure of (1), it is absorbed in an isolation region, and in the case of the structure of (2), the effect of an optical carrier can be prevented by the same principle with drawing 22 R> 2 having explained fundamentally. And although each structure complicates wiring, since potential is given according to an individual to an isolation region or the separated well, those potentials become what was stabilized over the whole panel. That is, all the active element circuits on a panel side can be operated stably on equal conditions.
[0025]
[Embodiment of the Invention] Hereafter, the operation gestalt of the reflective mold image display device of this invention is explained to a detail using drawing 18 from drawing 1 .
<<operation gestalt 1>> Cross-section structural drawing for 1 pixel of the reflective mold image display device concerning this operation gestalt is shown in drawing 1 . In this drawing, the element shown with the same sign as drawing 19 is the same as that of what was explained by drawing 19 , and the detailed explanation about them is omitted here. And the description of this reflective mold image display device is in the configuration of the following active element substrates 11.
(1) The protection-from-light layer 51 of aluminum is infixed in the insulator layers 4a and 4b.
(2) the protection-from-light layer 51 — the conductor by the side of reflector layer 8a and an active element circuit — opening for making pillar-shaped connection 8a' which has connected section 9a penetrate is only formed, and MOS-FET2 is followed also in the clearance between reflector layer 8a with the wrap in the arrangement part of the charge storage capacitance 3.
(3) The antireflection film 52 of Ti is formed in the top side of the protection-from-light layer 51.
(4) It changes flattening of the top front face into the optical mirror plane condition, and, as for insulator layer 4b with the protection-from-light layer 51 bottom, reflector layer 8a is formed on it.
(5) Reflector layer 8a consists of aluminum containing aluminum or Si of a minute amount, or/and Cu.
(6) insulating-layer 4a in a plane of composition with insulator layer 4a in reflector layer 8a, and pillar-shaped connection 8a', and a conductor — the antireflection film 53 of Ti is formed in the plane of composition with section 9a.
(7) in addition, a conductor — section 9a — the conductor of drawing 19 — it was not reflector layer 8a and really formed like the section 9, but reflector layer 8a and pillar-shaped connection 8a' is one, and explained by (6) — as — the pillar-shaped connection 8a' and conductor — section 9a is connected.
[0026] Next, sequential explanation of the production process of this reflective mold image display device is given including a layer and thickness, processing conditions, etc. First, MOS-FET2 of N channel mold is formed in the usual process by formation of an ion implantation, gate oxide, or an electrode to the single crystal Si substrate 1 of P type (drawing 2). moreover, the conductor which was made to **** the insulator layer 10 of SiO2 to the field contiguous to the source 7 of MOS-FET2, and connected the front face of said insulator layer 10 with the source 7 of MOS-FET2 — forming section 9a — the charge storage capacitance 3 — constituting — further — CVD (Chemical Vapor Deposition) — law — insulator layer 4a — forming — the active element circuits 2 and 3 — a wrap (drawing 3).
[0027] Next, after forming aluminum by the thickness of 3000A by the sputtering method on the whole top face of insulator layer 4a and forming Ti by the thickness of 1000A further, the field 61 used as the connection side by the side of reflector layer 8a is alternatively removed by the sputtering method (drawing 4). Consequently, the protection-from-light layer 51 of aluminum and the antireflection film 52 of Ti are formed.
[0028] The laminating of about 2 micrometers (4b) of the insulating spreading die materials, such as SOG, is carried out for the whole opening field 61 to an antireflection film 52 in a wrap mode after completion of the aforementioned process (drawing 5). and the front face of the insulating spreading die materials (4b) which carried out the laminating — CMP (Chemical Mechanical Polish) — mirror polishing is carried out to the display flatness of 5A or less by the main average of roughness height by law (drawing 6). in addition, PACE announced about this polish means the chemical polish by chemical etching, such as mechanical polishing, KOH, ammonia, etc. by particles, such as SiC, and recently — law (chemical etching using the plasma; J.Vac.Sci.Technol, B12 (6), Nov/Dec1994) etc. is applicable. Moreover, the through hole 62 slightly smaller than it is formed in the part corresponding to the aforementioned opening field 61 by the dry etching method etc. after the polish (drawing 7 R> 7).
[0029] Next, about 500A of antireflection films 53 of Ti is formed in the front face of insulator layer 4b ground by the sputtering method, and the inside of the aforementioned through hole 62 (drawing 8). Moreover, aluminum which contained

aluminum or Si of a minute amount, or/and Cu by the sputtering method is made to deposit on the antireflection film 53 bottom, burying the part of the aforementioned through hole 62. Pillar-shaped connection 8a' and reflector layer 8a whose thickness is about 6000A are formed by the dry etching using a pattern (drawing 9). In that case, since the front face of insulator layer 4b is beforehand ground to the aforementioned display flatness, when aluminum which the front face of reflector layer 8a became the display flatness of about 200A by the main average of roughness height when aluminum was used, and contained Si of a minute amount or/and Cu is used, the display flatness of dozens-100A is obtained. Moreover, it can prevent that Si contained in aluminum of reflector layer 8a and insulator layer 4b causes migration, and Si deposits on the front face of the reflector layer 8 by forming the antireflection film 53 of Ti.

[0030] As the front face by the side of reflector 8a is covered with the orientation film 12 and it is shown in drawing 1 and drawing 10 R> 0, the active element substrate 11 obtained at the above process is combined with the transparence substrate 21 with which the glass substrate 22 was covered with the orientation film 24, and a reflective mold image display device completes it by making the liquid crystal layer 30 **** among each orientation film 12 and 24. When the equipment of this operation gestalt was actually manufactured, it was able to be made to improve even to 80% to the reflection factor of the equipment of the structure shown in drawing 19 having been at most about 50%. Moreover, it can prevent that the read-out light 42 which carries out incidence from the clearance between reflector layer 8a since the protection-from-light layer 51 is provided as shown in drawing 10 infiltrates into the Si substrate 1 directly. And it is also related with possibility of the light which carried out incidence reflecting multiply on insulator layer 4b in respect of the bottom side [of reflector layer 8a], and protection-from-light layer 51 top, and infiltrating into the protection-from-light layer 51 bottom through opening of the protection-from-light layer 51, and the clearance between reflector layer 8a. It had prevented by antireflection films 52 and 53 being given to the opposed face of reflector layer 8a and the protection-from-light layer 51, and generating of photograph conduction has also been controlled.

[0031] By the way, although this operation gestalt constitutes the protection-from-light layer 51 from the monolayer extensively, it may consider as double lamination or you may make it the arrangement mode to a partial field. However, it can prevent anyway that the protection-from-light layer must have infixation / arrangement conditions of "being the top view seen from [of read-out light] incidence, and including the duplication field of the clearance field between each reflector layer, and the nonmetal configuration field of an active element circuit at least", and read-out light carries out direct incidence to the Si substrate 1 side to the bottom of the condition. (Since it sees from [of read-out light] incidence and all the active elements 2 and 3 are in the reflector layer 8a bottom with this operation gestalt, only the clearance field between each reflector layer 8a poses a problem.) the protection-from-light layer 51 consists of modes including the field. the conductor connected in addition to the circuit pattern by which a protection-from-light layer is connected with each terminal electrode of MOS-FET2 at it, or the charge storage section 3 — the method which enlarges section 9a superficially can also be made to constitute

[0032] moreover — as a cure on the problem on which the aforementioned multiple echo light turns to the protection-from-light layer 51 bottom, and infiltrates into it — each electrode and conductor of the bottom side of the protection-from-light layer 51, and MOS-FET2 — it is effective if the antireflection film (not shown) of Ti is given to section 9a. Furthermore, in constituting a protection-from-light layer from two or more layers as mentioned above, it forms the antireflection film in the opposed face side of each protection-from-light layer.

[0033] <<operation gestalt 2>> Cross-section structural drawing for 1 pixel of the reflective mold image display device concerning this operation gestalt is shown in drawing 11 . In this drawing, the explanation is omitted like the case of the operation gestalt 1 about the element shown with the same sign as drawing 19 . This operation gestalt is related with the structure for raising that reflection factor further in the equipment of the operation gestalt 1. and the description becomes a front face by the side of reflector film 8a of the active element substrate 11 of the equipment of drawing 1 from two or more dielectric films, as shown in drawing 11 — an increase — reflection — a membrane layer — it is in the point in which 54 was formed.

[0034] the increase of the above — reflection — a membrane layer — although 54 carries out the laminating of SiO2 film of thickness and TiO2 film which become lambda/4 to the wavelength lambda of the light by a total of eight layers by turns and obtains the active element substrate 11, as shown in drawing 12 after the process explained by drawing 9 from drawing 2 in the operation gestalt 1 is completed — the increase in that case — reflection — a membrane layer — all the thickness of 54 is 5000A or less. And as shown in drawing 11 , it is combined with the transparence substrate 21 with which the glass substrate 22 was covered with the orientation film 24, and a reflective mold image display device is completed by making the liquid crystal layer 30 **** among each orientation film 12 and 24.

[0035] the increase of here — reflection — a membrane layer — the reason for having made 54 into 5000A or less is explained. the case where a 4-set laminating is carried out to the case where the 1-set laminating of SiO2 film of lambda/4 of optical thickness and the TiO2 film is carried out, and the case where a 2-set laminating is carried out, as an experiment, and an increase — reflection — a membrane layer — the reflection factor property in a light wavelength region was searched for about the case where 54 is not prepared. In that case, when the number of laminatings of a group was made to increase, the reflection factor improved and it became about 99% in the case where it is a 4-set laminating, but the result that the wavelength band which shows a high reflection factor became narrow was obtained as the number of laminatings of a group was made to increase. the band was divided when restricting to narrow-band-ization of the range where a high reflection factor property is acquired — an increase — reflection — the film — combining is also considered. however, the number of laminatings of a group — increasing — an increase — when the thickness of whole reflective membrane layer 54 becomes large, the electric field concerning the liquid crystal between reflector layer 8a and the common electrode layer 23 will produce a flare, and will cause degradation of resolution conversely. When 5000A thickness was a limitation for obtaining 20 line/mm [more than] high resolution experimentally, the decreasing rate of resolution became large when it was exceeded, thickness was set to 14 line(s)/mm and thickness was set to 1.5 micrometers or more in 1.0 micrometers, being set to 10 line

(s)/mm was checked. and the increase of the aforementioned conditions — reflection — the film — as a result of giving 54, the reflection factor of equipment is improvable to 95%. Moreover, what was 60:1 in the former has improved to 120:1 also about contrast, and the quality projection image was obtained by high brightness also without degradation of resolution.

[0036] <<operation gestalt 3>> Cross-section structural drawing for 1 pixel of the reflective mold image display device concerning this operation gestalt is shown in drawing 13 . The equipment of this operation gestalt is filled up with an insulating material 55 between adjoining reflector layer 8a, and the description is that it carried out flattening of the front face which an insulating material 55 makes to each reflector layer 8a to the optical mirror plane condition.

[0037] If the front-face side of the active element substrate 11 in the reflective mold image display device (drawing 11) of the operation gestalt 2 is seen, the level difference of about 6000A equivalent to the thickness of reflector layer 8a exists in the clearance between reflector layer 8a so that clearly. This level difference may produce unusual reflection in the weld flash generated when reflector layer 8a formed. moreover — an increase — reflection — the film — although 54 is formed in the level difference section, the level difference section becomes the cause by which for a rough ******** reason a front face generates scattered reflection and reduces the contrast of a projection image, with the etching gas at the time of forming reflector layer 8a.

[0038] Then, it grinds until the front face of reflector layer 8a is exposed with the mirror-polishing means which formed the insulating materials 55, such as SOG, in about 1-micrometer thickness in the mode which fills between reflector layer 8a, and used them with the operation gestalt 1 after that, as it is shown in drawing 14 R> 4, after the process explained by drawing 9 from drawing 2 in the operation gestalt 1 is completed with this operation gestalt, and the excessive part of an insulating material 55 is removed. in this case — although it operates as a component even if the insulating material 55 remains on the front face of reflector layer 8a — increasing driver voltage **** — the increase of the after-mentioned — reflection — a membrane layer — since there are problems, such as causing decline in a reflection factor, when 54 is formed, an insulating material 55 needs not making the front face of reflector layer 8a remain. In addition, it is not necessary to necessarily make the front face of an insulating material 55, and the front face of reflector film 8a into the same flat surface, and if the front face of an insulating material 55 is the optical mirror plane which does not produce scattered reflection, it is sufficient for them. and it is shown in drawing 15 — as — the field after polish — receiving — the increase of the point of the operation gestalt 2 — reflection — the film — combine with the transparence substrate 21 with which the glass substrate 22 was covered with the orientation film 24 to be shown in drawing 13 after forming 54 and forming the orientation film 12 further — a reflective mold image display device is completed by making the liquid crystal layer 30 **** among each orientation film 12 and 24.

[0039] Since the factor which starts scattered reflection between reflector layer 8a is lost according to the equipment of this operation gestalt, improvement in the further reflection factor is realizable in that semantics. Also in the actually manufactured equipment, 96% of reflection factor was stably securable by high contrast.

[0040] <<operation gestalt 4>> Cross-section structural drawing for 1 pixel of the reflective mold image display device concerning this operation gestalt is shown in drawing 16 . while fields other than opening which the protection-from-light layer 51 makes penetrate pillar-shaped connection 8' are infixed in the wrap mode according to the structure shown in drawing 1 -- the pillar-shaped connection 8' — opening — leading — reflector layer 8a and a conductor — section 9a is connected and antireflection films 52 and 53 are formed in the bottom side of reflector layer 8a, and the top side of the protection-from-light layer 51. And antireflection films 52 and 53 have played the role which is made to decrease the quantity of light in the phase where light reflects multiply between reflector layer 8a and the protection-from-light layers 51, and prevents generating of the photograph conduction by the light from the clearance between the holes of pillar-shaped connection 8' and the protection-from-light layer 51 to the protection-from-light layer 51 bottom which permeates. However, it is as the conventional technique having explained that reflector layer 8a and the protection-from-light layer 51 will short-circuit, and the yield of a product will get very bad if attenuating permeation light completely only with antireflection films 52 and 53 if read-out light becomes powerful tends to make the aforementioned clearance small and it tends to acquire effectiveness impossible.

[0041] the source 7 near [by the way,] near pillar-shaped connection 8a' is the output terminal of MOS-FET2 with the structure of drawing 1 — setting — a conductor — it connects with section 9a and opening of the protection-from-light layer 51 is formed in the location corresponding to it. In that case, the aforementioned multiple echo light will reach to the clearance between the holes of pillar-shaped connection 8' and the protection-from-light layer 51, though decreased with antireflection films 52 and 53, it will infiltrate into the protection-from-light layer 51 bottom from the clearance, and will carry out direct incidence to the field of the nearby source 7.

[0042] So, with this operation gestalt, as shown in drawing 16 , two characteristic measures are taken. Although MOS-FET2 by the side of reflector layer 8a and the Si substrate 1 and the relative location of the charge storage capacitance 3 do not change the 1st description, they form pillar-shaped connection 8a' of reflector layer 8a in the location where only w approached the charge storage capacitance 3 side as compared with the case of drawing 1 , and it is in the point of making the location which becomes the outside of the formation field of MOS-FET2 constituting the hole of the protection-from-light layer 51, based on it. the conductor with which the 2nd description has connected the charge storage capacitance 3 with the source 7 of MOS-FET2 — the source 7 side of section 9a is extended to a gate 6 side — making — a conductor — the description is that it has covered the formation field bottom of the source 7 completely by section 9a. therefore — the formation field top of the source 7 in MOS-FET2 — the protection-from-light layer 51 and a conductor — it becomes the configuration covered with the duplex by extension partial 9of section 9a a.

[0043] the permeation location which carrying out direct incidence of the light which infiltrated into the protection-from-light layer 51 bottom as mentioned above to the field of the source 7 was lost, and kept away only w with those cures to the protection-from-light layer 51, and a conductor — between section 9a — reflecting multiply — further — a conductor — if extension partial 9of section 9a a is not bypassed, it cannot reach to the source 7, but the probability in which light carries

out incidence to the source 7 so much can be reduced. moreover, a conductor [in / in the structure of this operation gestalt / the production process of the operation gestalt 1] — it can obtain easily only by changing a pattern, respectively in the formation phase of section 9a, and the formation phase of a through hole 62, and application of the structure which naturally starts the operation gestalten 2 and 3 is also possible. in addition, the operation gestalt 1 also explained — as — the bottom side of the protection-from-light layer 51, and a conductor — it is still more effective if the antireflection film is prepared also in the top side of section 9a.

[0044] <<operation gestalt 5>> — although this operation gestalt takes various kinds of measures against protection from light with the operation gestalt 1 or the operation gestalt 4 and prevention of the permeation light to the Si substrate 1 is aimed at — it in addition — and in consideration of permeation light occurring, drawing 17 shows cross-section structural drawing for 2 pixels of that reflective mold image display device. This operation gestalt has the description in the point that the drain 5 of MOS-FET2 which is N type, and the isolation region 56 of the same conductivity type as the source 7 are formed between the active element circuits which adjoin each other on the Si substrate 1 of P type so that clearly, if the equipment of drawing 10 R> 0 and drawing 17 is contrasted.

[0045] As opposed to the Si substrate 1 having GND potential in this structure Even if each isolation region 56 is maintained at (+) potential of a reverse bias, multiple echo light turns to the protection-from-light layer 51 bottom through the clearance between pillar-shaped connection 8' of reflector layer 8a, and opening of the protection-from-light layer 51 and it reaches the Si substrate 1 Since the electron hole of the carrier generated on that occasion is absorbed to the GND side of the Si substrate 1 and an electron is absorbed immediately in an isolation region 56, it can prevent that an electron reaches the drain 5 and the source 7 of MOS-FET2. Therefore, the bad influence which it has on actuation of the active element circuits 2 and 3 can be prevented in a culmination, and the photograph conduction by permeation light can prevent the degradation phenomenon of an image, when especially read-out light is strong. When the conductivity type of the Si substrate 1 is N type, naturally the same effectiveness is acquired only by a drain 5, the source 7, and an isolation region 56 becoming P type, and the potential impressed becoming reverse.

[0046] <<operation gestalt 6>> The place made into the purpose of this operation gestalt is the same as that of the operation gestalt 3, and drawing 18 shows cross-section structural drawing for 2 pixels of that reflective mold image display device. This equipment so that clearly, if the trouble of the equipment of drawing 22 concerning the conventional technique is canceled and the equipment of this drawing and drawing 18 is contrasted In drawing 22 , well 1a of P type is formed all over one side of the Si substrate 1 of N type. MOS-FET2 of N channel mold for every pixel consists of drawing 18 of this operation gestalt in the well 57 of the separated P type to constituting MOS-FET2 and the charge storage capacitance 3 of N channel mold in the common well 1a, without carrying out a well in common.

[0047] And although the Si substrate 1 of N type is set as + potential and each well 57 is set as GND potential also with the equipment of this operation gestalt, even if permeation light reaches the Si substrate 1 and a carrier is generated, an electron will be absorbed to the GND side and an electron hole will be absorbed to the nearby well 57. Therefore, the electron based on photograph conduction can prevent reaching a drain 7, and can be prevented from causing degradation of an image. Although the equipment of this operation gestalt is the same as the equipment of drawing 22 , when it is made into the structure of common well 1a like the equipment of drawing 22 about migration of a carrier, since GND potential is directly given every well 57 with the equipment of this operation gestalt to GND potential destabilizing in the field greatly isolated from the GND node, all MOS-FET2 stabilizes and operates and it can prevent degradation of an image. When the conductivity type of the Si substrate 1 is used as P type, it is also the same as that of the case of the operation gestalt 5 that the same effectiveness is acquired.

[0048]

[Effect of the Invention] The reflective mold image display device of this invention does the following effectiveness so by having the above configurations. read-out light carries out incidence of the invention of claim 1 to the base of an active element substrate directly, and it improves the reflection factor in a reflector layer while it prevents carrying out photograph conduction generating — making — quality — high — the display of a brightness projection image is enabled. the top view which looked at protection-from-light layer with the much more invention of claim 2 from [of read-out light] incidence — the 2nd conductor — the hole for penetration of the section — when infixing the whole surface of an except in a wrap mode, the effective cure against photograph conduction in the light which infiltrates into the protection-from-light layer bottom by keeping away the location of the hole of a protection-from-light layer from the formation field of a switching element is realized. In invention of claim 2, invention of claim 3 detours the path which the light which infiltrates into the protection-from-light layer bottom reaches to a switching element for a long time, and realizes the still more effective cure against photograph conduction. invention of claim 4 raises the display flatness of a reflector layer, and improves a reflection factor further — making — high — the display of a brightness projection image is enabled. Invention of claim 5 is reflected multiply between a reflector layer and a protection-from-light layer and between between protection-from-light layers. It controls that the scattered light carries out incidence to the base of an active element substrate, and generates photograph conduction. In spite of the effectiveness of claim 5, especially invention of claim 6 which prevents that image quality deteriorates when displaying an image using a strong read-out light prevents the phenomenon in which light turns to the protection-from-light layer bottom, and is reflected multiply and scattered on it, and prevents deterioration of image quality. the increase of invention of claim 7 — reflection — a membrane layer — a reflection factor is conjointly improved further with a reflector layer — making — moreover — an increase — since the thickness of a reflective membrane layer does not become so large, while maintaining high resolution — high — the display of a brightness projection image is realized. the increase of invention of claim 8 — reflection — the film — the optimal conditions are given and a high reflection factor is realized. Invention of claim 9 prevents scattered reflection by making the level difference part between reflector layers into an optical mirror plane, does not have the fall of contrast, and makes a high reflection factor secure stably. Invention of claim 10 is enabled to perform mirror polishing of the insulator layer in claim 1 and the reflector layer in claim 9, and a restoration insulating material

with high precision. even if invention of claim 11 and claim 12 uses the protection-from-light means and the control means of the scattered light in each aforementioned claim — in addition — and a carrier is made to absorb as a cure in case light carries out incidence to the base of an active element substrate and generates photograph conduction, so that an active element circuit may not be affected, and degradation of an image is prevented. Moreover, the active element circuit concerning all pixels is stably operated by supply of stable bias potential.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is cross-section structural drawing for 1 pixel of the reflective mold image display device concerning the operation gestalt 1 of this invention.
[Drawing 2] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 3] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 4] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 5] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 6] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 7] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 8] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 9] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 10] It is cross-section structural drawing for 2 pixels for explaining the protection-from-light function of the reflective mold image display device concerning the operation gestalt 1.
[Drawing 11] It is cross-section structural drawing for 1 pixel of the reflective mold image display device concerning the operation gestalt 2.
[Drawing 12] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 2.
[Drawing 13] It is cross-section structural drawing for 1 pixel of the reflective mold image display device concerning the operation gestalt 3.
[Drawing 14] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 3.
[Drawing 15] It is cross-section structural drawing showing the manufacture phase of the reflective mold image display device concerning the operation gestalt 3.
[Drawing 16] It is cross-section structural drawing for 1 pixel of the reflective mold image display device concerning the operation gestalt 4.
[Drawing 17] It is cross-section structural drawing for 2 pixels of the reflective mold image display device concerning the operation gestalt 5.
[Drawing 18] It is cross-section structural drawing for 2 pixels of the reflective mold image display device concerning the operation gestalt 6.
[Drawing 19] It is cross-section structural drawing for 1 pixel of the conventional common reflective mold image display device.
[Drawing 20] It is the representative circuit schematic of a reflective mold image display device.
[Drawing 21] It is cross-section structural drawing for 2 pixels to show the migration mode of a carrier when photograph conduction occurs with the conventional reflective mold image display device.
[Drawing 22] It is cross-section structural drawing for 2 pixels of the conventional reflective mold image display device which

took the measures against photograph conduction.
[Description of Notations]
1 [— MOS-FET.] — Si substrate, 1a — A common well, 1b — An N type part, 2 3 [— Gate.] — Charge storage capacitance, 4, 4a, 4b — An insulator layer, 5 — A drain, 6 7 — 8 The source, 8a — A reflector layer, 8a' — Pillar-shaped connection (the 2nd connection), 9 and 9a— a conductor — the section (9: the 1st connection) and 9a'— a conductor — the extension part of the section — 10 [— Transparence substrate.] — An insulator layer, 11 — 12 An active element substrate, 24 — The orientation film, 21 22 [— The clearance between reflector layers.] — A glass substrate, 23 — A common electrode layer, 30 — A liquid crystal layer, 41 42 [— An insulating material, 56 / — An isolation region, 57 / — A well, 61 / — The field used as the connection side by the side of a reflector layer, 62 / — Through hole.] — The light, 51 which carry out incidence to the clearance between reflector layers — 52 A protection-from-light layer, 53 — An antireflection film, 54 — increase reflective membrane layer, 55

[Translation done.]

* NOTICES *

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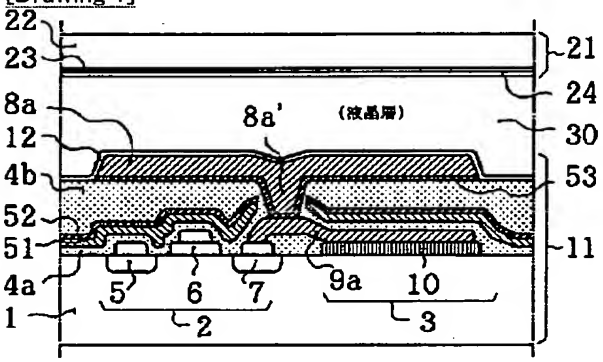
damages caused by the use of this translation.

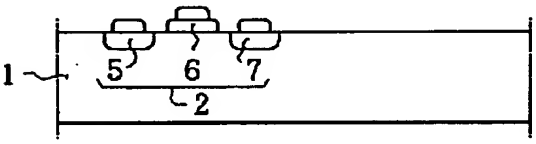
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

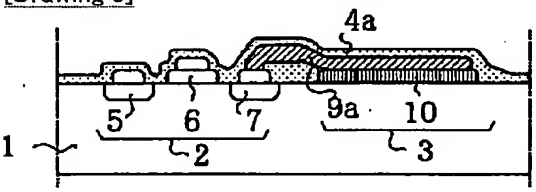
[Drawing 1]



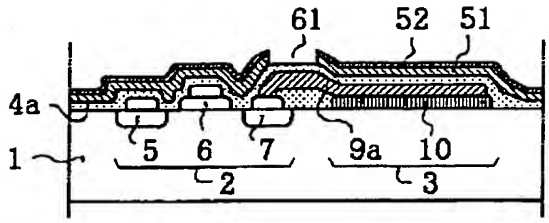
[Drawing 2]



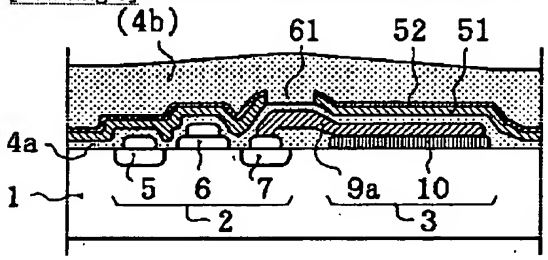
[Drawing 3]



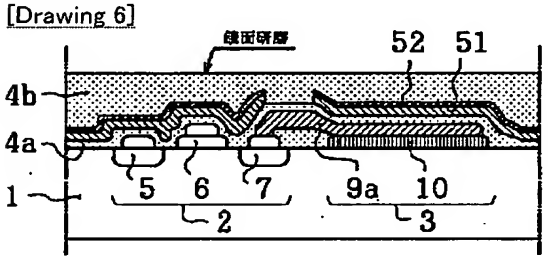
[Drawing 4]



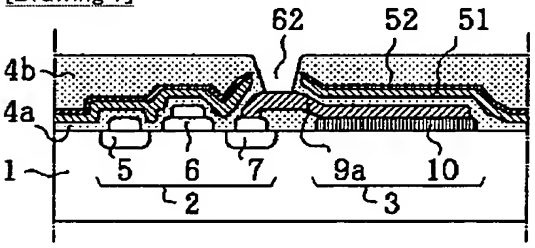
[Drawing 5]



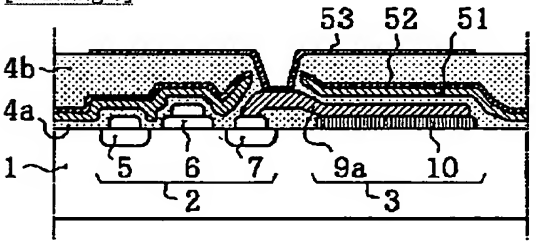
[Drawing 6]



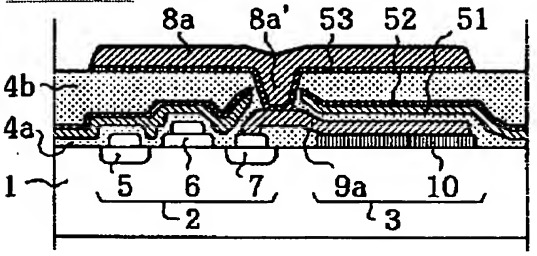
[Drawing 7]



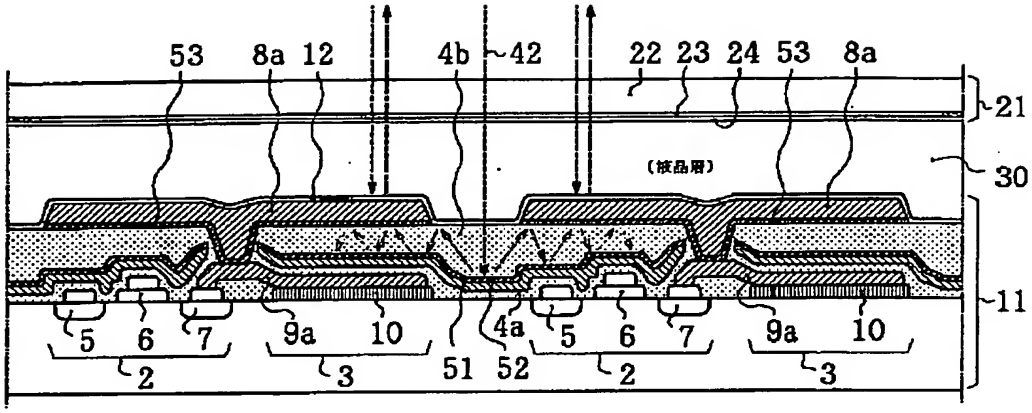
[Drawing 8]



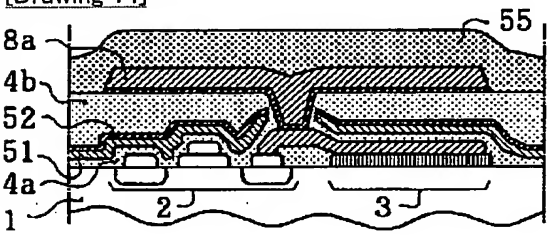
[Drawing 9]



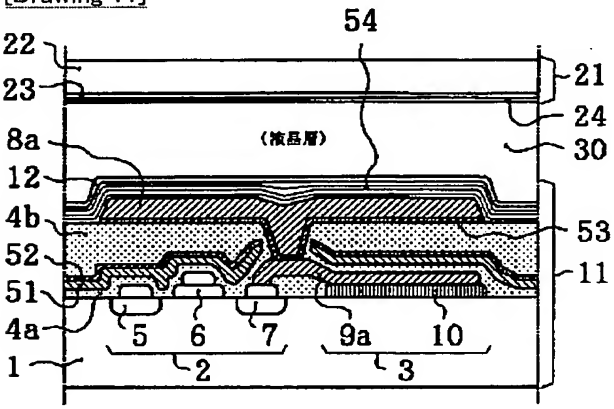
[Drawing 10]



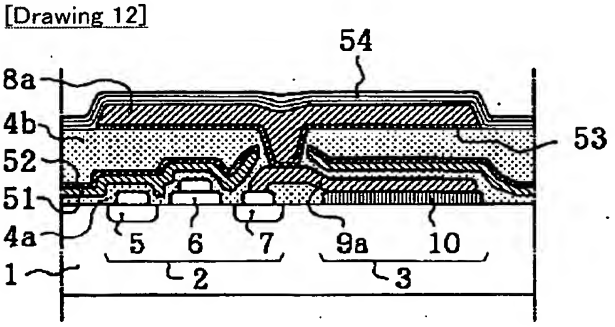
[Drawing 14]



[Drawing 11]



[Drawing 12]



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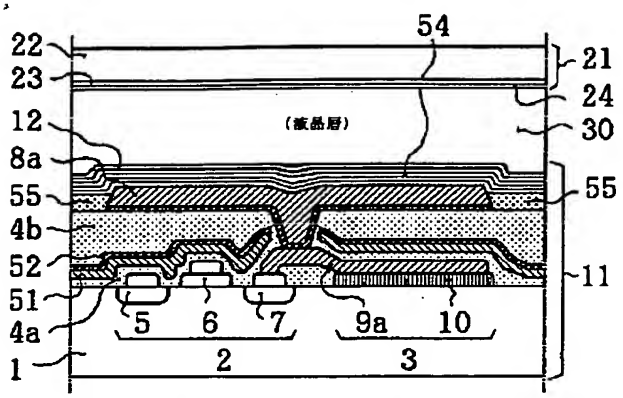

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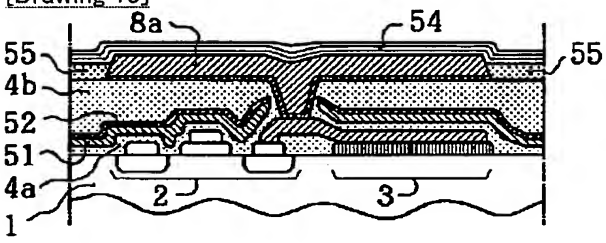

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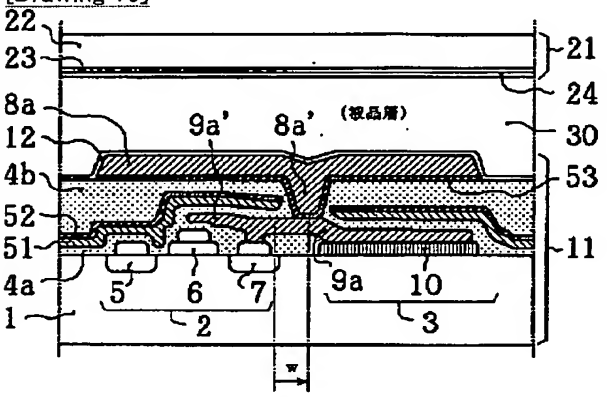

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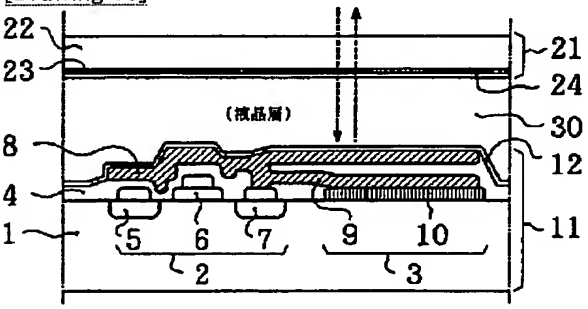
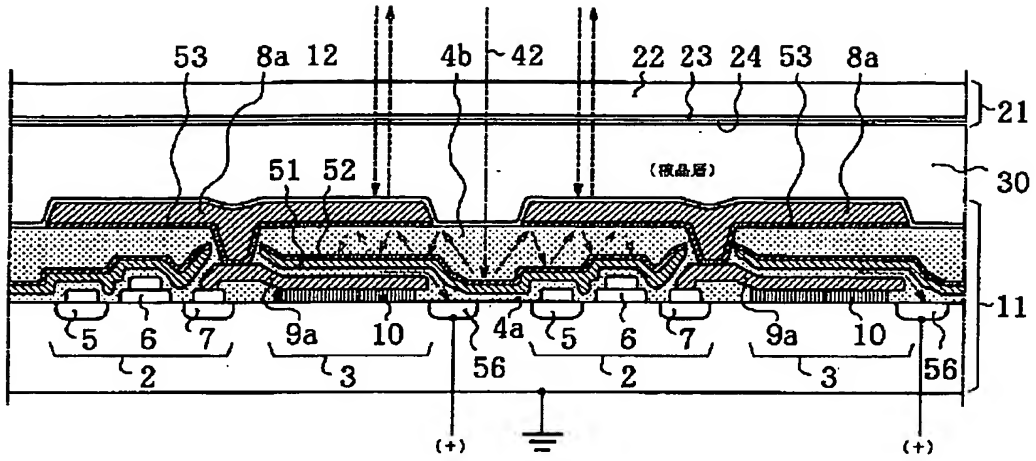


[Drawing 17]



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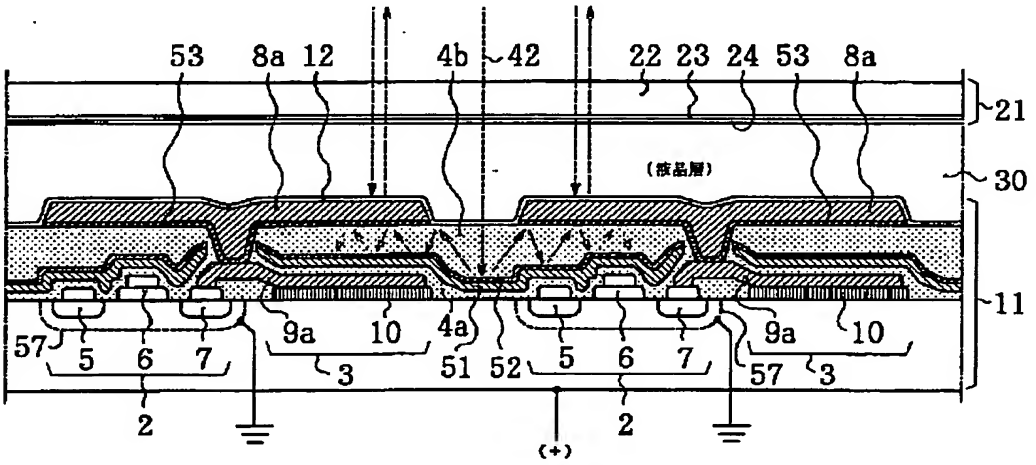
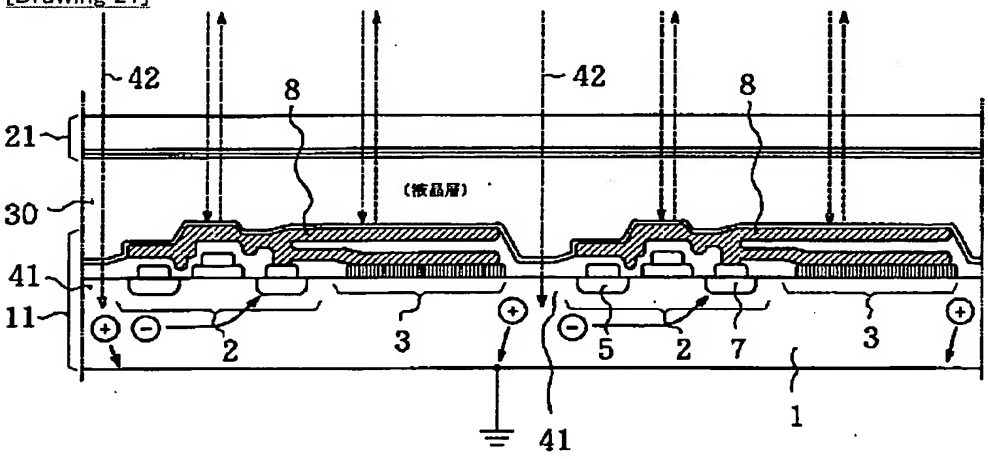
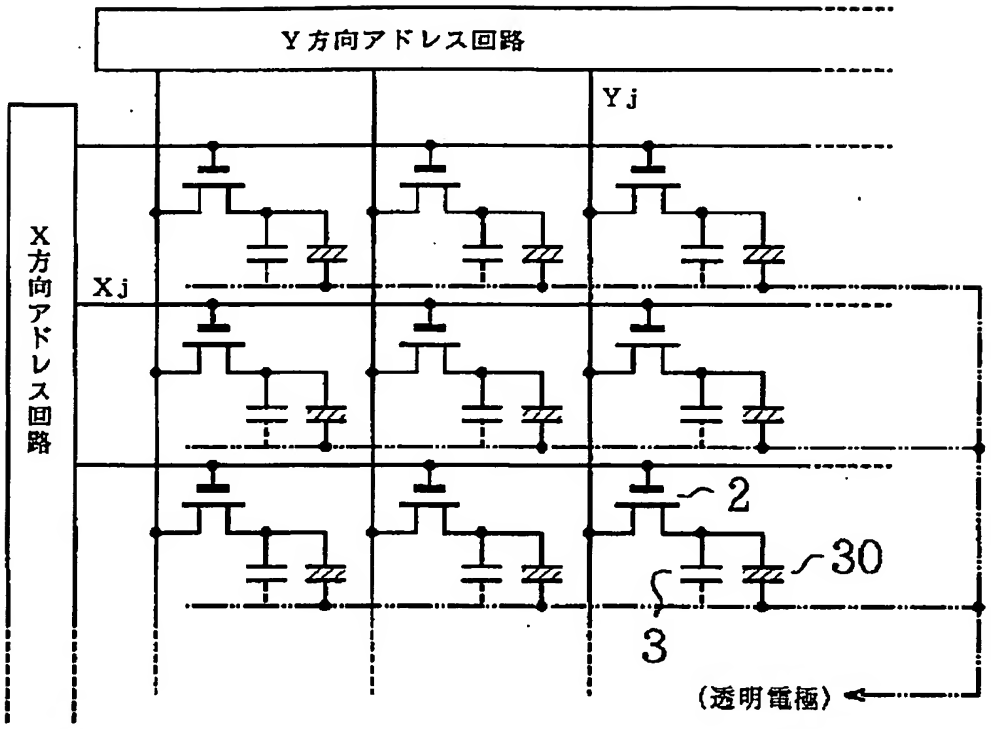


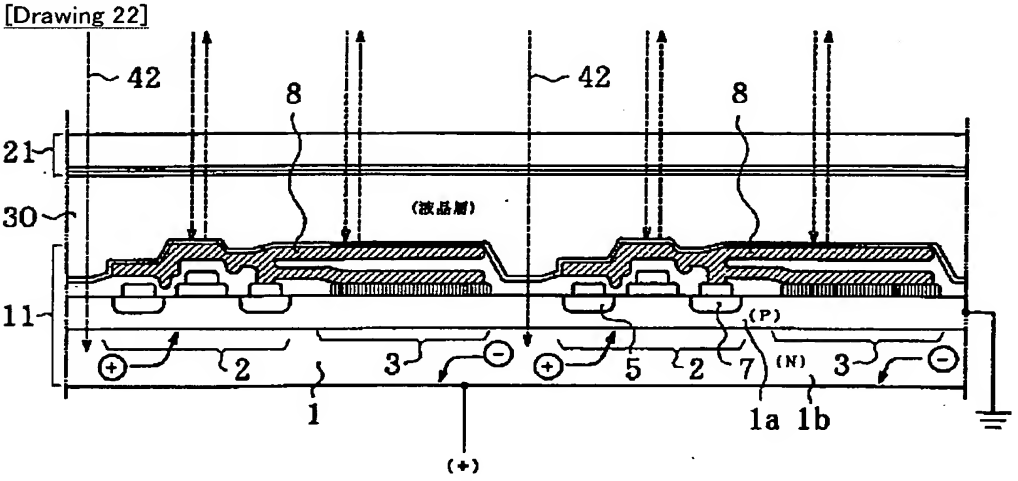
[Drawing 21]



[Drawing 20]



[Drawing 22]



[Translation done.]